

# Ecosystem Management and Restoration Planning Guide:

# Drylands

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**USDA - Natural Resources Conservation Service, Durham, NH**

Alan P. Ammann Ph.D., Biologist



Dry (Xeric) forest near Keene airport. Note pitch pine in right foreground and little bluestem in opening.

**USDA NRCS**  
Natural Resources Conservation Service  
(603) 868-7581 - [www.nh.nrcs.usda.gov](http://www.nh.nrcs.usda.gov)

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## **PURPOSE OF THIS DOCUMENT**

The purpose of this document is to provide guidance for planning ecosystem management and restoration projects in saline tidal wetlands in New Hampshire. It is intended for professional environmental planners including NRCS field office personnel. It may also be useful as an educational tool for interested laypersons including members of town Conservation Commissions. Non professional uses of this document are cautioned that ecosystem restoration requires professional judgement based on education and experience.

## **GEOGRAPHIC AREA TO WHICH THIS DOCUMENT APPLIES**

This document is intended for New Hampshire. Knowledgeable persons can apply it to New England. Many of the principles and structure of this document can be adapted to other areas of the United States

## **ECOSYSTEM DESCRIPTION**

Drylands are those portions of the New Hampshire landscape that typically have low available soil moisture due to their coarse textures soils and position in the landscape. Under natural conditions fire dependent sub-climax communities (Pine Barrens and native grasslands) occur as a patchwork within a matrix of white pine (*Pinus strobus* L.) and mixed hardwood dry forest matrix. The sub-climax communities arise in the open sunny conditions following fire and are dominated by pitch pine (*Pinus rigida* Miller), red pine (*Pinus resinosa* Aiton) and to the north by jack pine (*Pinus banksiana* Lambert). The herbaceous layer of the fire maintained sub-climax typically has a sparse layer of leaf litter. Ground cover is typically dominated by low bush blueberry and scrub oak. Native warm season grasses may dominate openings. On highly disturbed sites (e.g. where fire is very frequent) warm season grasslands may persist for long periods.

In the absence of fire, white pine and mixed hardwoods eventually overtake and shade out pitch pine and other Pine Barren plants. If fire is suppressed long enough for the white pine - mixed hardwood forest to develop, the herbaceous layer typically resembles this forest type.

There is a thick leaf litter and herbaceous layer vegetation is more or less suppressed by shade.  
 Low bush blueberry, if present, occurs as scattered patches in sunny openings.

## CLASSIFICATION OF DRYLANDS (SHADING INDICATES OCCURANCE)

### Ecological Sub-unit

M212Ad	M212Ae	M212Af	M212Ba	M212Bb	M212Bc	221Ai	221Ak	221Al
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### Elevation

Below 0.0 NGVD	0.0 NGVD - Mean High Tide	Mean High Tide - 15 ft NGVD	15 ft NGVD - 2500 ft	2500 ft - 6,200 ft.
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### Land Form

Beach	Barrier Dune	Headland	Fringe	Flooded Valley	Tidal flat
Glacial outwash plain	Flood Plain	Stream Terrace	Rocky Shore	Closed Depression	Open Depression
Drainage Way	Low Gradient stream channel	High gradient stream channel			

### Moisture Regime

			Marine
			Estuarine
Dryland	Moistland	Wetland	Aquatic (freshwater)

## Substrate

Bedrock	Boulders Stones	Gravel	Sand	Silt	Clay	Loam	Loamy soils	Peat	Muck
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## NEW HAMPSHIRE MAPPING CONVENTIONS

- ❑ Soil Map Units (from the New Hampshire Statewide Numerical Legend) 26A, 26B, 298, 299, 599, 510A, 510B and 510C

## IMPORTANT FUNCTIONS

- ❑ Wildlife Habitat - especially rare moths and butterflies
- ❑ Noteworthiness - Fire maintained forests and grasslands are rare in the humid northeast

## MAJOR STRESSORS AND THEIR IMPACTS

- ❑ Fire Suppression
  - The Pine Barrens and dry native grasslands are fire maintained sub-climax communities, and need to be burned periodically. In the absence of fire, white pine and mixed hard wood communities out compete Pine Barrens plants.
- ❑ Past agricultural and forestry practices
  - Pitch Pine was selectively eliminated due to its low commercial value.
  - In southern New Hampshire many Pine Barren sites were cleared for agriculture.
- ❑ Human encroachment
  - Dry sites were selectively developed from the earliest times because of the ease of construction. Along the coast, the earliest roads were put in along the dry sand ridges. Currently a significant amount of development still occurs on these sites. For example the major Pine Barrens near the Concord, NH Airport is heavily fragmented and developed.
- ❑ Sand and gravel mining

- The glacial outwash soils that support dry forests are also important sources for sand and gravel.

## RESTORATION STRATEGY

The overall strategy is to return a significant area of dryland to a fire maintained sub-climax (Pine Barren and native grassland). The specific plants associated with these communities vary by ecoregion. In more southern and coastal areas, the dominant tree of Pine Barrens is pitch pine. North of the New Hampshire Lakes region, they are generally dominated by red pine and jack pine. The term significant cannot be precisely defined in acreage but the implication is that enough area would be restored to serve as refugia for those species of plants and animals associated with fire maintained regimes.

- ❑ Protect and manage identified tracts of dry forest such as the Nature Conservancy Preserve in Ossipee, NH.
- ❑ Inventory potential restoration sites, these include
  - Remnant Pine Barrens consisting of small pitch pine stands in various stages of succession on excessively drained soils. Early succession sites often have characteristic herbaceous layer vegetation including low bush blueberry and scrub oak. Favor sites that can be expanded or linked to other similar sites. Even small highly fragmented sites may be valuable to rare moths and butterflies.
  - Gravel pits, abandoned pastures and other disturbed sites on excessively drained soils without pitch pine present.
  - White pine - mixed hardwood forests on excessively drained soils.
- ❑ Proactive outreach to owners of potential restoration sites. The Conservation Districts can play an important role in this.

## RESTORATION MEASURES

- **Prescribed burning**

Prescribed fire is used as a management tool by trained personnel. Such fires burn along the ground as opposed to wildfires that often set the tree canopy ablaze. The conditions under which a prescribed fire is set are specified in the prescription. The idea is to burn under conditions that maximize the desired effects of the fire, while

minimizing the danger of fire escape. This is done by careful consideration of such factors as air temperature, days since the last rain, wind speed, fire breaks and relative



humidity.

The frequency of burns depends on the amount of unwanted vegetation that needing control. Burns that are more frequent and/or used in combination with selective mechanical removal of competing vegetation may be necessary on sites that have been without fire for a long time. Once the desired plant community has become established burning should be done at three to five year intervals. In areas, where it can safely be done prescribed fire is probably the most important single tool for Pine Barren and dry grassland restoration. The other listed measures could probably be used in addition to fire depending on the particular circumstances of the restoration site.

- **Selective mechanical removal of competing vegetation**

This can be done in a variety of ways. Selective harvesting of trees such as white pine and oak would open the canopy, providing sunny areas adjacent to pitch pine for regeneration. This is important on sites where competing trees are too big to be controlled by prescribed burning. Opening up the canopy would also benefit lupine and other herbaceous plants and grasses which are intolerant of shade.

Mechanical removal of brush is also possible using a brush hog on smaller plants and a rotary brush cutter mounted on an excavator ("Brontosaurus") on larger brush and trees.

- **Chemical control of invasive plant species**

Proper use of herbicides is an important tool for ecosystem restoration. In particular it is useful for the removal of invasive plants such as autumn olive. Invasive plants are typically alien plants or selected varieties of native plants that out-compete native plants. Autumn olive for example was first released for use as a wildlife shrub unfortunately, because it was selected for its vigor and hardiness it has become a noxious weed in some parts of the country. In one Pine Barren in Manchester, New Hampshire it is shading out native wild lupine. Cutting or mowing autumn olive and many other invasive plants is ineffective because they simply sprout from underground stems and roots. To successfully remove these plants they must be treated with a systemic herbicide that kills the roots.

- **Planting native plants**

Obviously, if one or more Pine Barren plants are not present on an otherwise suitable droughty site planting is a practical alternative. Some native Pine Barren plants are now available from state and private nurseries. It is likely that an even wider selection will become available as ecosystem restoration in general and Pine Barren restoration specifically becomes more widespread.

The following planting information for drylands is based on work by The Nature Conservancy (VanLuven, 1994) unless otherwise noted. Larva of the Karner blue butterfly feed exclusively on wild lupine. Adults use a variety of nectar sources. One of the key elements for the Karner blue butterfly and other moths and butterflies are nectar sources for the second brood which hatch later in the summer and early fall when many plants are past flowering. In New Hampshire, suggests five native plants as a second brood nectar source; New Jersey tea (*Ceanothus americanus*), spreading dogbane (*Apocynum androsaemifolium*), common milkweed (*Asclepias syriaca*), wild bergamot (*Monarda fistulosa*) and meadowsweet (*Spiraea alba*). Collectively these plants flower from mid-June to the end of September.

The suggested planting rates to support a second brood population of 1,000 Karner blue is 1,000 wild lupine, 100 New Jersey tea, 100 spreading dogbane, 100 common milkweed, 100 wild bergamot, and 100 meadowsweet.

The recommended method of planting is by direct seeding. Seedling survival rates are not well documented but indications are that it is in the neighborhood of 20 - 30 percent. This suggests a seeding rate of three to four times the number of desired plants. Use local native seed where possible. Do not collect more than 25% of the seeds from any wild lupine patch.

The Nature Conservancy and Natural Heritage recommends against the purchase of generic wild lupine seeds because the genetics of wild lupine are not well understood. NRCS, however, feels that in a restoration situation in which there are no native wild lupine present and local native seed is not available it is acceptable to use purchased seed.

Watering  $\frac{1}{2}$  twice weekly is recommended for the first four to six weeks following germination. Keep weeds from shading out new plantings with a weed eater or other methods.

- **Mechanical/chemical site preparation** (e.g. physical removal of leaf litter to promote pitch pine seedlings and for planting of native plants)

Site preparation may be as simply as removal of leaf litter and other ground cover by raking, disking or other mechanical means. Mechanical site preparation would be especially important where prescribed burning cannot be done. The purpose of mechanical site preparation is to mimic the ground clearing effects of fire. Under natural conditions wildfires burn off the leaf litter on droughty sites exposing bare mineral soil. This provides the sunny bare sites necessary for reseeding pitch pine, lupine and other Barren plants.

Herbicides may also be necessary under some circumstances to control weeds and prepare an acceptable seed bed for native plants.

- **Releasing of seed trees**

In those areas where the removal of all competing vegetation is impractical, positive results can be obtained by removing competition around individual pitch pine trees



or other target plants. This practice is done in forestry around commercially valuable trees.

- **Monitoring**

The monitoring of a restoration site is important because it allows us to learn from our mistakes as well as our successes. A qualified professional should develop monitoring plans; however, volunteers or individual landowners could carry out many of the monitoring tasks.

## **PLANNING CONSIDERATIONS**

The restoration measures for a particular site depend on several factors including:

- Successional Stage

- Early successional dry forests
  - ◆ Depending on previous land use planting of native plants may be required. Pitch pines readily seed into gravel pits and disturbed areas if there is sufficient pitch pine on the margins.
  - ◆ Fire maintained warm season grasslands on dry sites are one of the few native grasslands in New Hampshire. Managing dry sites for grasslands may include planting warm season native grasses on abandoned gravel pits.
- Mid and late successional dry forest may require selective cutting of white pine, oaks, and other trees to reduce competition for pitch pine.

- Proximity to human infrastructure

- Use of prescribed burning is obviously more difficult near residences and roads. However, the proper use of prescribed fire may reduce the overall fire danger by reducing fuel loads.

- Existing plant community

- The more intact the plant community the easier the restoration. Experience has shown that the herbaceous layer of later stage Pine Barrens typically resemble white pine oak forests rather than Pine Barrens.

- Social/Political factors

- The attitude of the landowner and neighbors is critical to successful restoration of dry forest since we are dealing with the very emotional subject of fire.

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